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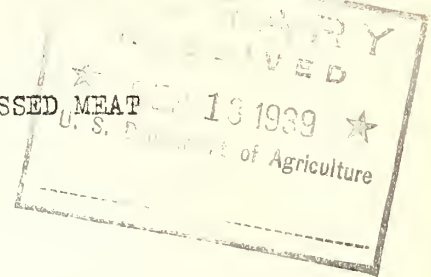
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United States Department of Agriculture  
Bureau of Animal Industry  
Animal Husbandry Division

COLD-STORAGE LOCKERS FOR PRESERVING FARM-DRESSED MEAT

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A cold-storage locker is a "safe-deposit box" or unit in a room maintained at a temperature of nearly zero Fahrenheit, where families may freeze and store food supplies that have been grown at home or bought. Meats, poultry products, butter, fruits, and vegetables are stored successfully in these units, sometimes for as long as a year. Lockers of about 250 pounds capacity each rent for about \$5 to \$12 per year, with or without an additional service charge for preparing, packaging, and freezing foods.

Ten years ago there were a few scattered locker plants in 3 or 4 States. Today there are over 1,800 in 38 States. The expansion is continuing.

The early locker plants were places where a patron could store his bundle or basket of food at temperatures that were usually below freezing. Today many locker plants are complete foodhandling units where all kinds of foods are processed and sold as well as stored at carefully maintained temperatures, usually about zero F.

These plants often provide additional facilities for dressing and curing meat, precooling market eggs and berries, storing game, butter, ice cream, and fox food, and for protecting fur coats in summer. Also, the plants serve as distributing points for commercial, quick-frozen foods.

Cold-storage lockers and the continuing adaptation of their equipment to local needs are but natural steps in the progressive task of bringing refrigeration closer to the farm home. Locker plants do not replace household refrigerators, pressure canners, or curing barrels. They are a supplementary means by which a family may maintain an adequate food supply at all seasons of the year.

Families use cold-storage lockers because they enjoy adding fresh frozen products to the regular diet of canned and salted foods. Village patrons find that they can buy from the farmer or wholesaler, a better quality of food, especially beef, than the local retailer often can afford to carry. Sportsmen use lockers for storing fish, venison, and birds. All patrons can have foods from the locker at a lower cost than the generally prevailing retail prices.

### Economy of Lockers

Locker charges for meat will average about 2 cents per pound for rental (500 pounds of food through a \$10 a year locker) and an additional 1-1/2 cents per pound for the processing when meats are chilled, cut, and wrapped at the plant. When a plant employee slaughters an animal there is an additional charge of about one-half cent per pound of meat (\$2 per head for dressing steers). This 3-1/2 to 4 cents per pound gross locker charge is in contrast to the larger commercial costs of shipping, marketing, and dressing live cattle and distributing and retailing the carcasses.

Broadly speaking, farm families can have a 12 months' supply of fresh frozen retail cuts from their own animals at a cost that varies from less than the wholesale cost of a similar carcass (\$6 a year locker and no service charges) to one that may exceed wholesale costs by about 1 or 2 cents per pound (complete service units). The local locker manager thus earns an income on each pound of meat put through the plant and still saves the consumer most of the normal retail mark-up.

Village residents or farm families not having suitable stock to slaughter often buy commercial, inspected sides or quarters from the more complete locker plant. They pay the current wholesale price plus the 3-1/2 cents per pound locker charge plus a 1- to 2-cent brokerage or buying charge. This 4-1/2 to 5-1/2-cent total locker charge is less than the customary 6- to 10-cent per pound mark-up by retail meat dealers.

Families using cold-storage lockers are also able to buy and store quantities of chickens, eggs, garden products, and meats at the seasons when those products are relatively cheap. Foods that are canned or cured at home are cheaper than frozen products provided the equipment, containers, and fuel are available and there is no loss through spoilage. Meat-curing houses, in the South, charge 1-1/2 to 2-1/2 cents per pound for curing home-dressed meat under refrigeration.

Lockers have some disadvantages. Among them are: (1) The necessity of having to plan ahead for food supplies; (2) the initial cash cost for locker rent and purchased food; (3) the inconvenience of having to go to the locker plant for food instead of to the cellar; (4) the deterioration of foods stored under improper conditions, or kept too long in the locker; and (5) the use of the stew and shank meat after the more tender cuts have been eaten.

Thus freezer lockers do not appear to be a panacea for all the problems of the food trade, but neither are they something that has been foisted on the public by equipment salesmen. With the more widespread distribution of electric power and the marked improvement in automatic refrigeration equipment, cold-storage lockers and freezing have become new tools with which the consumer and all members of the meat and food industry are attempting to obtain better and cheaper food.

### Home-Grown Foods Cheapest

The satisfactory use of a locker depends, in large measure, on having an ample quantity of desirable foods for storage in it. Growing those foods at home is the cheapest way of providing them. On many farms it is the only way. Incomes on these farms are insufficient to purchase all the family's needs and such money as is used for buying food must curtail the amounts spent for other necessities. Through the use of family labor and existing land and equipment, foods can be produced at home with only a minor additional cash outlay. With a home-raised food supply on hand fluctuations in prices and income do not greatly affect the family's diet. What the family has to eat thus becomes more dependent on its own efforts and less on the current price of wheat, cotton, or livestock. There is the same food value in a pound of butter or a can of peas or a roast of meat, regardless of the market price.

With a home-grown supply of lean meat, dairy and poultry products, fruits, and green vegetables, families have available the essential proteins, minerals, and vitamins reported as deficient on 40 percent of the farm tables. Cold-storage lockers are an economical means by which these rather seasonal foods can be preserved and used through-out the year.

### Types of Locker Units

Two main types of locker plants are now being operated. The limited-service plant provides only a locker. Patrons prepare and package their own products and spread or pile them unfrozen in their lockers. The so-called full service plant supplies the equipment and help for one or more of the following: (1) Buying the raw products such as live animals, dressed carcasses, or crates of fruits and vegetables; (2) preparing the foods for storage, such as slaughtering, chilling, aging, cutting, grinding, curing, wrapping, and labeling the meat, or washing, blanching, chilling, and packaging the vegetables; (3) spreading the packaged products in the sharp freezer and placing the frozen foods in the respective lockers; and (4) removing the packages from the lockers, as needed, and delivering them to the owners (a few plants only). Separate charges are made for each of these services.

The greater convenience and possible efficiency of each kind of service must be balanced against the ability of the family to do an equally successful job, and, also, the ability of the family to pay the extra costs. Some sacrifice in quality of the product or length of storage period, due to imperfect methods, is of less importance to certain communities than the extra cost of more complete service. A correct decision as to the type of service needed is important to both the patrons and the man who hopes to own and operate a successful locker plant.



## EFFECTS OF FREEZING

Before deciding on the type of locker best suited to a locality, it is well to study the effects of freezing on foods in order to prevent troubles that are likely to be encountered.

The changes that occur in some stored foods may improve them, as in the case of ripening apples, cheese, or beef. Also, the changes may result in the development of undesirable flavors, odors, colors, and textures, or even in spoilage.

These changes are due largely to the growth of micro-organisms such as bacteria, molds, and yeasts, to the action of chemical substances called ferments or enzymes which are naturally present in foods, to oxidation, to drying, to the actual freezing, and to time in storage.

### Bacteria, Molds, and Yeasts

Bacteria, molds, and yeasts, the chief cause of most food spoilage, grow rapidly at temperatures around 70° F. and slowly between 33° and 40°. Some grow very slowly at temperatures between 15° and 20° but there appears to be no microbial action at temperatures below 15°. Fresh foods should be chilled promptly and kept cold until properly frozen.

### Effect of Enzymes

Enzymes or ferments are chemical agents normally present in fruits, vegetables, meats, fish, and other foods. They are also produced by growing micro-organisms. These enzymes cause or stimulate chemical changes in foods. Because of the action of enzymes, freshly slaughtered beef and lamb become more tender when ripened or aged properly. On the other hand, enzymes are also partially responsible for odd flavors in stored foods and for the rancidity that may develop in frozen pork fat.

Enzymes produce changes rapidly in normal air temperatures about 70° F., they work slowly between 33° and 40°, much more slowly at temperatures around 15°, and very slowly at zero. To retard their action requires a lower temperature than that needed to stop bacterial growth; zero is recommended by most research workers.

### Oxidation

The oxygen in the air often combines with stored food, producing new substances just as iron and oxygen form rust. The dark, brownish color that develops on lean beef and some of the rancidity developing in pork fat are due to oxidation.

Oxidation is very rapid at high temperatures, is slower at temperatures between 33° and 40° F., and is still slower at zero. Oxidation

may proceed, however, even at zero, and protection from the air through wrapping or glazing with ice is often needed for stored frozen products.

### Freezer Burn

Foods dry out rapidly at the humidities usually prevailing at high temperatures, as evidenced by the ready wilting of many vegetables and fruits. Drying is ordinarily slower at the chill-room temperatures of 33° to 40° but even within that range stored foods will shrink unless the surrounding air is kept relatively moist. The evaporation of ice from foods stored in freezers is slower than that of water from unfrozen products but the drying continues even at zero or below. The dried, pithy, outer layers of some stored frozen lean meat and other foods is called "freezer burn." Uniform temperatures in properly designed freezers will decrease the rate at which frozen products lose moisture but only by wrapping or packaging foods in moisture- and vapor-proof coverings can the relatively dry, freezer air be prevented from robbing stored foods of water.

### Rapid Freezing Desirable

When water freezes it tends to freeze as pure water pushing aside, as it were, any lime, iron, sulphur, or other substances dissolved or suspended in it. When the water in meat juice freezes it does the same thing, pushing aside the material that gives color, flavor, and food value to the juice. Some of the changes in composition are not reversible, that is, the normal meat juice is not reformed when the meat is thawed. The character of thawed meat and the quantity of drip from it are associated with the amount of this change in composition, resulting from freezing.

When meat is frozen rapidly the meat juice sets before much of the water can separate from it. In meat frozen slowly the separation of the juice is greater. Quickly frozen meat, therefore, more nearly resembles fresh meat, after thawing, than does the slowly frozen product. Some investigators believe that there is less damage to the cell structure in quick-frozen meat than occurs where freezing is slow.

Hence, the rapid freezing of meats is desirable.

### Time in Storage

Time in freezer storage is the last of the major factors affecting changes in frozen foods. The longer the storage period the greater the opportunity will be for the enzymes, air, and drying process to act. When foods have been properly selected, prepared, packaged, frozen, and stored, a 6- to 12-months' storage period is not impractical. When freezer-storage conditions are not ideal, especially if the storage temperatures vary widely, up and down, or are kept at levels much above zero, the quality of the foods will be better if the stored products are used and replaced with fresh ones every few months.

### Needed Locker Facilities

If frozen food is to retain its highest possible quality, a locker plant should have an ample chill room, maintained at about 34° F., a small sharp freezer room (temperature about -10°); a locker room, designed to maintain a zero temperature; and a processing room for preparing and wrapping chilled foods. Patrons of less complete units, containing only the locker room, must appreciate the limitations and govern their methods and storage periods accordingly.

Whether equipment for additional services should be included in building a locker plant depends on local needs. Southern plants find a great demand for meat-curing rooms as do many northern ones. Power grinders for making sausage and hamburger, smokehouses, lard-rendering and vegetable-blanching equipment, slaughterhouses, etc., will provide useful services, but their addition to the locker plants should depend on the needs of the community to be served. It is easy to add so much equipment that the cost of the plant is too great for the owner and the cost of the services too great for the patrons.

### Sanitation

Before deciding on the type of locker plant best suited to a community, both patrons and owner should remember that there can be no compromise with the fundamental laws of sanitation. Cleanliness is an essential part of wholesomeness and no group, however poor, can afford the risk of contaminated food.

### LOCATION, CONSTRUCTION, AND OPERATION

The proper location, construction, and operation of a locker plant are important to the patrons as well as to the cooperative or private organization that plans to own one. Patrons need not concern themselves with all the details but the general principles relating to their convenience and to the satisfactory and economical storage of their foods should be understood.

The best location for a locker plant is in a popular trading center connected by good roads to a large number of self-sustaining, diversified, family-size farms. Plants are successful under many less favorable conditions but the more families living nearby who do or can raise their own food, the greater the number of potential patrons. Village residents constitute over 50 percent of the locker renters in some plants.

Many patrons drive in from a radius of 10 or 12 miles to a locker plant. Some come farther. Nearby towns offer the danger of a future competing plant or the possibility of a branch plant.

The plant should be located so that it can be reached easily and safely by the patron or his wife and children. A small town with a minimum of traffic and parking problems often provides a better location than a larger city.



Three hundred lockers is usually considered as small a plant as should be operated as a separate business. Some plants contain over 1,000 lockers. A majority of plants are run in connection with some other business, such as a retail meat store, ice plant, creamery, or ice cream factory. With this set-up as few as 100 lockers have proved profitable. Combining a locker plant with some other business is reported to stimulate that other business.

### Construction

The second essential in the satisfactory operation of a freezer-locker plant is the proper planning and construction of the building and equipment. Incoming products should move directly from the unloading platform to the chill room, thence through the cutting or processing room to the sharp freezer, and then to the locker room. Patrons coming to their lockers should pass through the end of the cutting room or within sight of it. This gives the operator, working in that room, a chance to see the people coming in and to give them such service as they may need.

A chill room 16 by 20 feet inside, with rails 2 feet from the wall and 4 feet from each other, will hold the quarters from 12 heavy beef carcasses or 55 average-weight hog carcasses. This allows 18 inches of rail space per quarter and 14 inches per hog carcass. Rails 7-1/2 feet high will clear beef quarters and most hog carcasses with heads removed. The rails should extend from the receiving platform to the chill room and out into the cutting room. This permits moving the meat with as little labor and contamination from handling as possible.

Where much pork is to be cured it is desirable to have a separate "salt" room held at a temperature of 36° to 38° F. In the South where natural winter temperatures are rarely low enough to cure pork safely a large room may be essential. A room 17 by 31 feet inside will hold about 45,000 pounds of curing meat.

A sharp freezer 6 by 8 to 10 feet inside has been found large enough in most plants.

A locker room 17 feet wide will hold 40 lockers for every 3 feet 5 inches of length if the lockers are 30 inches deep and 20 inches wide and are erected in stacks of five. This width permits a stack against each wall, a double stack in the middle of the room, and two 3-foot aisles between rows of lockers. The whole arrangement should be such that more space for locker storage can be added if needed.

Substantial, ratproof construction of the building is essential. The floor of the locker room should be made to carry its great load without danger of settling or cracking the insulation.

Mistakes in selecting and installing insulation, compressors, and coils are constant sources of loss and are expensive to repair. Too much emphasis cannot be laid on the necessity for expert engineering aid

in determining the material needed and in supervising its installation.

Four inches of cork board or its equivalent is recommended for insulating the chill room, 6 inches for rooms to be maintained below freezing, and 8 inches for rooms intended for zero or lower temperatures. Imperfectly installed insulation becomes wet rather rapidly from the condensation of moisture in the infiltrating outside air. Wet or otherwise imperfect insulation soon results in overwhelming power bills, if the proper temperatures can be obtained at all.

Attention is called to the fact that engineers do not recommend the installation of the floor of a permanent, large freezer below the level of the ground. Even with a tiled or well-drained soil and excellent insulation, there is always a chance that the ground will freeze and heave the foundations of the building.

The automatic refrigeration equipment should be of sufficient capacity to maintain proper temperatures but compressors that are much oversize or coils that are undersize are too expensive to own and operate. When sufficient coils are used the temperature in them can be held no lower than 10° below that of the room to be chilled. Temperature variation in the room is also more easily controlled to 2° above or below the point desired. Both these things will help retard the rate at which the stored foods will dry out.

When forced air circulation is used in the locker room care is needed to prevent unduly rapid air movement which may speed the rate at which the stored foods dry out. All the coils should be placed or fixed so that they can be defrosted easily.

#### Equipment

Whatever type or size of locker is used it should be built so that the single lockers or a stack of lockers can be removed for cleaning and sunning. If lockers are 17 inches high and built in stacks of five the bottom of the top locker will be about 5 feet 10 inches from the floor. Stools will be needed to permit patrons to reach into this top row. Lockers of varying sizes are often used. Locker doors should be reasonably theftproof.

The cutting or processing room should contain easily cleaned tables for cutting and wrapping meat. Power saws and grinders are often included. Kettles for rendering lard and blanching vegetables and a smokehouse, if included, are usually placed so that the heat and steam from them or the boiler do not reach the cutting room.

A locker plant is a food-storage plant and all floors and walls should be built and finished so that they can be cleaned easily. Insulation, paint and other finishes, and equipment should be of kinds that will not impart odors to the stored food.

All trucking of live animals, if a slaughterhouse is operated in

connection with the locker plant, should be so routed that such trucking does not cross the traffic of those bringing in or coming for food products.

### Cost of Locker Plant

The cost of constructing and operating a locker plant is of importance to both the owner who must build it and the patrons who must support it. The estimated cost of a 300-locker unit, including building and equipment, will vary around \$10,000. In case existing buildings or refrigerator equipment can be utilized the cost will be less. Some larger and more complete plants have cost \$20,000 to \$30,000. Before construction is started the owner and prospective patrons can be mutually helpful in determining where justified costs end and promotional enthusiasm begins. If the units are of proper size, are largely rented, and are well operated, the income from a locker plant should be sufficient to pay for operation, labor, depreciation, interest, insurance, curtailments on the loan, and other expenses. These locker units, however, should not be, and, in the face of current competition, probably cannot be a source of unusual profit to the owners.

### Selecting a Manager

Even though a locker plant is properly located and constructed, it must be operated properly if it is to succeed. The locker business is a retail business and is therefore subject to all the familiar retail troubles. The manager must be salesman enough to go out and obtain new business and he must be diplomat enough to keep it. To succeed he must remember the needs and peculiarities of not only the patron himself but also of the patron's wife and children. He must be a good collector, a more than passable meat cutter and food handler, and something of a mechanic. Many successful managers have started with native intelligence, energy, and a pleasing personality. Later, they learned the other things. However, all the qualifications are needed if the patrons are to obtain the services desired.

### Service Rules

The service given by the locker management will vary in accordance with local needs. Nevertheless, the rules and the charges should be well advertised. Some of the questions and costs to be decided are: (1) Can the farmer dress his own animal at home, can he have a butcher come out from the plant to dress it, or will the plant or some local butcher kill and dress it if the owner hauls it in? (2) Can the farmer bring in a warm carcass for chilling and aging and come in later to cut and wrap it himself or is all cutting and wrapping, as well as freezing done, for a charge, by the management? (3) What disposition is to be made of hide and edible offal and of the cutting trimmings that the plant does not grind or render, and how soon must the owner call for these parts? (4) Does the owner receive an itemized inventory of the numbered labeled packages put in his locker or how is he assured that none of his meat was lost? (5) Can a person sell or buy a carcass through the locker management and what is the difference, if any, in the charge? (6) What days and hours is the plant



open so that patrons can come to their lockers? (7) Can small packages of meat or fruits, vegetables, etc., be put in the lockers without suitable preparation and freezing and if not what method must be used? (8) Who replaces a lost locker key and what is the cost? (9) If there are peak seasons when products come in faster than the chilling and cutting rooms can handle them, how does a customer establish his turn? (10) What type of contract between operator and renter should be signed? (11) If lockers are rented largely by the year, can a patron rent an extra locker for a month or more? (12) Can barreled foods or whole carcasses be put in bulk storage at temperatures either above or below freezing? (13) When are locker rentals and service charges due, and what action may the plant take if these bills are neglected?

### Rentals and Service Charges

Rental charges for lockers vary from about \$5 to \$25 a year, depending partially on the size of the locker. Ten dollars is the customary charge. Charges by the management for chilling, cutting, and wrapping the meat have varied from a cent to 1-3/4 cents a pound; 1-1/2 cents is about the customary charge. Charges for grinding meat and making sausage are about 1 cent a pound; for rendering lard, 2 cents a pound on weight of rendered lard; for curing meat 1-1/2 to 2-1/2 cents a pound; and for buying meat carcasses, 1 to 2 cents a pound. Slaughter charges range from \$2.50 per head for cattle dressed on the farm to 4 cents a head for poultry. Fruits and vegetables are frozen for 1/2 to 1 cent a pound. Total income for the plant from these service charges approximates the sum derived from locker rentals.

Paper needed for wrapping meat cut at the plant is taken care of by the cutting charge. Special containers for fruits and vegetables are usually bought at wholesale by the plant and sold to patrons at cost.

Insurance of locker contents, against theft, damage from fire, power failure, or mechanical breakdown, is available at a small monthly charge. These premiums are normally added to patrons' labor rentals.

### Laws Regulating Locker Plants

A few States have licensed freezer-locker plants under existing laws governing cold-storage warehouses. Plant owners in several States are now backing some proposed legislation written especially to meet the problems of the freezer-locker plant. Such a law was passed recently in Iowa. Sanitary requirements, maximum permissible temperatures, and certain basic procedures are described in this legislation.

### PLANNING THE FOOD SUPPLY

Where a locker plant is available to a farm family definite planning of the food supply is essential if a rented locker is to give full service. Each locker will hold only about 250 pounds at one time and fresh food must be available at different times so that 500, 700, or 1,000 pounds of



food may be put through the locker during the year. Meats can be made available more frequently than fruits and vegetables. With a curing room available at the plant, hogs can be slaughtered periodically, the hams and bacon being cured, and the loins, shoulders, and ribs frozen.

Feeding a calf to 300 or 500 pounds or more will provide about half that much fresh beef, or possibly more than can be crowded into one locker. In that case another locker may be rented for one or more months. Often half of a beef may be sold or traded to a neighbor and repayment made, months later, when that neighbor kills a steer. Having animals to dress just before harvest or haying, solves one of the food problems when extra hands must be boarded.

Frying and roasting chickens can be dressed and frozen when they are plentiful and cheap, and kept in a cold-storage locker until needed. Some cafes find this an economical procedure. Hens can be dressed whenever they quit producing. Eggs are broken and frozen, when plentiful and cheap, and kept in the cold-storage locker for baking, scrambling, etc., in the fall when fresh eggs usually command a high price.

In planning the garden, it is advisable to include some of the kinds and varieties of products that will be especially adapted to freezing. Full directions for selecting and freezing fruits and vegetables are given in Miscellaneous Publication No. 47, published by the U. S. Department of Agriculture.

The final plan for supplying the family's food should include:

1. A sufficient quantity to last throughout the year.
2. A sufficient variety to provide the proteins, minerals, vitamins, fats, and other nutrients needed.
3. The production spaced throughout the year so that the various foods will be available when needed.
4. The kinds of food that the family enjoys.
5. The kinds of food best suited to preserving by freezing, canning, curing, storage in a cellar or cave, or such other methods as may be available.

### PREPARING MEAT FOR LOCKER STORAGE

#### Selection

For meat select animals of the size and fatness that will produce the weight and quality of cuts preferred by the family. Excessive finish is unnecessary but an ample fat covering increases the desirability of the meat and protects the lean from drying during freezer storage. This applies to the selection of poultry as well as to beef, pork, and lamb. Veal dries out more rapidly than fatter, more mature beef.

All meats should be from healthy, thrifty animals and suitable for human consumption. Efficient, veterinary inspection is already available at some points. Perhaps this community effort to freeze and store locally dressed meat will advance the day when such inspection will be available, at moderate cost, for more of our country-dressed meat.

### Dressing

A good "stick" and a clean job of dressing are essential. Bloody meat or meat that has been contaminated in dressing or hauling will not keep as satisfactorily as that which has been prepared properly. It is easy to lose much valuable, desirable food if the home-dressed animals are not carefully dressed. For example, the often imperfectly cleaned head and feet of a hog carcass constitute 9 percent of the hog's live weight; 3 to 5 pounds of cheek meat, suitable for grinding, can be trimmed from a steer's skull; the frequently discarded lamb liver is normally just as tender and delicious as calf's liver. Directions for dressing meat animals are given in many State bulletins and in U. S. D. A. Farmers' Bulletins No. 1186 "Pork on the Farm," No. 1415 "Beef on the Farm," and No. 1807 "Lamb and Mutton on the Farm."

### Chilling

Warm, freshly slaughtered meat carcasses may spoil within 12 to 18 hours if not properly handled. They should be chilled to temperatures around 34° to 36° F. as soon after dressing as possible. In warm weather the fresh carcasses must be hurried to a chill room. Delay in chilling pork fat is believed also to cause changes that speed up the development of rancidity after the pork is frozen. Warm carcasses should be hung so that they do not touch. Hog carcasses will chill more rapidly if the head is removed, the carcass split, and the heavy blanket of leaf fat pulled out. The need for prompt and thorough chilling of warm carcasses cannot be over-emphasized.

### Aging Chilled Meat

Pork and poultry are not aged but are packaged and frozen as soon as thoroughly chilled. Much is still to be learned about retarding the development of rancidity in frozen pork but many operators agree that freezing the meat as soon as the carcass is chilled (36 to 48 hours) may help.

Beef and lamb will become more tender if held in the chill room for a week or ten days after slaughter. During this storage period the enzymes and possibly other agents soften the connective tissues. Actual freezing has been shown to increase the tenderness of beef somewhat but the ripening which occurs during chill-room storage is believed to be practically stopped by subfreezing temperatures.

When meat is held too long in the chill room mold develops on the exposed lean surfaces, the shanks, neck, skirt, etc., producing undesirable

stale odors. If these parts are not trimmed carefully before freezing those odors will reappear when the meat is thawed. Meat that is protected with a good outer layer of fat resists mold growth longer than the thinner carcasses. Properly designed chill rooms that keep the stored meat dry help retard mold development. High-grade beef cuts are often aged for 6 weeks/<sup>or</sup> longer in dry commercial coolers, but a week to 10 days is as long as is normally necessary in a locker plant, and this may be too long for thin cuts held in wet coolers.

### Cutting

Whether cut by the owner or by the locker manager, each carcass should be divided so as to meet the needs of those who are to eat it. Size of roasts, number and thickness of steaks and chops, amount of ground meat, proportion of fat in sausage, closeness of the trim, and the like must be adapted to the family's wishes.

If the beef carcass is from a reasonably young, well-bred, well-fed animal the rib and top round can be cut into satisfactory steaks and the first cuts from the rib and arm side of the chuck are usually tender enough to be cooked as oven roasts. Conversely, if the animal was old, thin and plain, not even the loin steaks may be tender enough for frying but should be braised or "~~Swiss~~ed." Meat cutters who know beef can help their patrons by classifying the cuts as frying, roasting, braising, or stewing pieces.

The family will enjoy some of the good quality loin steaks cut an inch or inch and a half in thickness. Thin steaks, such as are often cut from the round, dry out too much if stored long. Removing the bone saves storage space but boned cuts should be trimmed and tied or sewed into compact roasts before freezing.

Smoked pork is often stored in freezers to prevent the growth of mold and infestation by insects. The freezing of smoked pork would seem an unnecessary expense except under special conditions. Sausage is usually ground and frozen without seasoning. The salt and fresh, aromatic spices are added after thawing. Ground meat is reported to be less suited to prolonged, freezer storage than unground meat.

### Wrapping

Even in properly designed locker rooms, enough ice will evaporate from unwrapped frozen lean meat to produce a dry, pithy, undesirable outer layer. Further protection is needed if the meat is to be stored for any length of time.

Airtight cans or jars are often used for packaging chilled meat but their initial expense, the extra space required for them in the locker, and the difficulty of adapting them to large meat roasts, make them impractical in many cases. Paper and paper cartons are largely used for wrapping foods to be frozen.



The paper best suited for wrapping foods to be stored in the locker should be water- and vapor-proof (moisture won't evaporate through it), easy to fold and wrap, tough so it won't tear, capable of receiving an ink stamp (Locker 24, pot roast, March 3), and inexpensive.

Paper waxed rather heavily on one side is probably the cheapest of the wraps now in general use. Some users report that the wax checks or cracks somewhat at zero temperatures and that care is needed to prevent tearing. Some plant operators wrap cuts in waxed paper then double wrap in ordinary butcher paper. This extra labor and paper would reinforce the package against tearing but the butcher paper would be but slight additional protection against drying.

Several special, more nearly vapor-proof papers and cellophanes are also on the market. Costs per pound of cellophanes are higher than those of waxed papers though the number of square inches per pound of cellophane is greater.

Waxed fiber or paper, pint and quart-size, cups are used for fruits, vegetables, liquid eggs, sausage, etc., and some companies make nonwaxed cartons with moisture proof lining. One-, two- and five-pound capacity paper, cellophane or special composition bags are also available.

Two sheets of waxed or otherwise water-proof paper between the chops or steaks that are wrapped together will permit the removal of one or more of them from the bundle without thawing. In general, each bundle should contain the meat needed for a single meal or the quantity that the family wishes to cook at one time.

In wrapping, the edges of the paper can be folded together and the ends rolled or turned in, in the same manner that a confectioner wraps a box of candy. Careful wrapping and tying may do more to make an airtight package than several thicknesses of paper.

No recommendation as to the best wrap seems advisable at this time. Families and managers must decide which material is cheapest and most practical for protecting their foods. It should be remembered that the longer the storage period in the freezer the more need for an airtight wrapping.

### Labeling

Rubber stamps for labeling each package with the locker number, kind of food, and date are available at moderate cost. The addition of the storage date will help the family to locate the foods that have been stored the longest and should be consumed first. It may also protect the manager from unfair criticism if some long-forgotten slightly rancid package of pork is believed by the patron to be part of a recent kill.

### Freezing Chilled Foods

The chilled, prepared, wrapped, or packaged meat should be spread promptly for freezing. Deterioration of meats may be very rapid if



brought into the cutting room and allowed to warm up and sweat for any length of time. Poultry, eggs, and other foods that have been prepared and packaged at home should be moved promptly to the freezer. Where the family brings in products for the locker and expects to take home other foods from it during warm weather, two trips to the plant are generally necessary. Holding either the incoming or outgoing foods in the car while the family shops and visits may cause loss of quality if not spoilage.

Chilled, packaged foods can be piled so close together on the coils or shelves of a sharp freezer that freezing will be slow even at  $-10^{\circ}$  F. with forced air circulation. Spreading the packages so that contact or air flow will remove the heat quickly is desirable. Foods are frozen within 8 hours in the sharp freezers of some plants, three batches being handled in 24 hours during peak times.

Where no sharp freezer is available the patron should spread rather than pile unfrozen foods in the locker. Freezing will be more rapid if this is done. At best, however, this procedure will be slower, raising the temperature of frozen foods in the same and adjacent lockers, and it may add odors to the locker room and drip to the locker underneath.

#### Utilization of Frozen Foods

The length of time that foods can be held in a cold-storage locker without serious loss of quality will depend on the kind and grade of food and on the operation of the plant. Patrons must sample their products periodically through the months to determine what periods are most satisfactory under their conditions. Pork should be used preferably within 3 months, although it has been kept for 10 months at zero without becoming strong. If the paper or containers do not prevent undue drying, more efficient wrapping may be desirable when the next food is stored.

Home-made insulated boxes are often used to protect frozen foods when they are taken home for use. When a quantity of food is removed from the locker at one time there is often sufficient ice in it to maintain sub-freezing temperatures in this box for several days.

Thawing food is wet food and the moist surface offers an ideal place for spoilage bacteria to grow. Frozen foods, therefore, must be kept frozen, thawed in a household refrigerator (holding for a day or so only), or cooked promptly.

Combination household refrigerators and freezers are on the market, with freezing compartments varying in capacity from one-half cubic foot to six or eight cubic feet. Larger home-made insulated boxes for similar use on larger and specialized farms, plantations, or ranches have been designed and tested by the Washington State College and others. The familiar ice cream storage cabinet, and the 10 to 20 member cooperative community chill room, pioneered by the Tennessee Valley Authority, are all additional examples of ways in which refrigeration is being made more readily available to the family that is trying to produce and preserve its own food supply. Each type of cooling or freezing equipment

has its own special place. The central locker is probably the cheapest source of freezing temperatures. It is also the least convenient. To be used economically and satisfactorily food must be withdrawn from the locker and taken home when some member of the family is making a trip to town on other errands. It has been observed that families possessing a household refrigerator use a freezer locker to the best advantage. The household box supplements the locker.

Meats and poultry can be cooked satisfactorily with or without thawing. All reports indicate that frozen foods require somewhat less time to cook than similar fresh products, except possibly foods cooked without previous thawing. Roasts, particularly, would require time to thaw as well as to cook.

### PREPARING OTHER FOODS FOR LOCKER STORAGE

#### Poultry

Poultry is usually starved long enough, before killing, to empty the crop, then dressed carefully, chilled, wrapped, and frozen. Cold well water (preferably ice water) can be used to chill the birds if no other method is available.

Chilled poultry is often drawn before freezing and these "oven-ready" birds are much appreciated when cooking time arrives. Prompt freezing after drawing is essential as bacteria and molds develop rapidly in the moist body cavity.

Frying and stewing chickens are often chilled, cut-up, and the cold parts packed in cans, cartons, or packages for freezing. Sometimes the cut-up chicken is packed in a shallow pan, covered with water and frozen as a block of ice. This is a variation of glazing in which the ice coating serves as further protection against drying and oxidation.

To glaze a bird it is first frozen and then dipped into water chilled to about 34° F. or just above freezing. The zero temperature of the frozen bird freezes a thin layer of ice on it. Repeated dippings will build up any desired ice coating. Wrapping the bird to delay the evaporation of the glaze is customary.

#### Freezing Eggs

Fresh, chilled, eggs are prepared for locker storage by breaking them into a clean bowl and beating or churning them thoroughly until the yolks are broken and well mixed with the whites. This churning prevents an undesirable coagulation of the yolk solids during storage. The whites may be separated from the yolks and packaged without churning but the yolks should be well beaten.

Commercial companies package liquid eggs in sterilized airtight tins. Waxed-paper cartons, as nearly airtight as possible, are used in

most locker plants where tin is not available. Containers should be of such size that each one will contain about enough eggs for a meal of scrambled eggs, cake, or a batch of salad dressing.

Frozen eggs may be thawed in the refrigerator or at room temperature or, if the container is tight, in running water. Thawed eggs may be cooked or used in baking just like fresh eggs except that they should be used promptly after thawing.

### Shell-Egg Storage

Putting relatively cheap spring eggs into chilled storage for resale in the fall is a familiar commercial practice and many locker plants have requests from their patrons for this service. Shell-egg storage is practical but certain essentials must be understood and considered by both patron and operator before it is undertaken.

Only clean, strictly fresh eggs are suitable for storage and all eggs should be chilled promptly. In summer, some poultrymen gather eggs four or five times each day, moving them directly to the chill room.

The egg storage room must be separate from all other rooms and entirely free from odors. The recommended temperature is 29° F. with a variation of only 1° either way. The relative humidity is kept usually at 80 to 90 percent.

"The Cold Storage of Eggs and Poultry," U. S. D. A. Circular No. 73, contains full directions for freezing and handling poultry products.

### Fish

Fish will retain more of their fresh quality if they are chilled promptly and kept cold until frozen. Backing them in a clean container with cracked ice while hauling them to the locker plant is common practice.

The fish are cleaned, heads, etc., removed, washed, cut into family size portions, if necessary, and frozen. Fish can be wrapped before freezing but are frequently frozen, glazed, and wrapped by the same method used for glazing poultry.

Odors are generally absent after the fish has been frozen and glazed.

### Butter

Creamery butter, made from pasteurized cream, is often packed in tubs or the familiar pound prints and stored at zero for 6 months or longer. Home-made butter churned from unpasteurized sour cream, would probably have an undesirable flavor after a few weeks' storage in a locker. Butter made from sweet cream will keep better than that made from sour cream; it will keep still better if made from pasteurized sweet cream.



The home pasteurization of cream is described in Leaflet 9, "Making and Storing Butter on the Farm for Winter Use," prepared by the U. S. Bureau of Dairy Industry. This method is suggested for making butter to be stored for more than a month. Packing the butter in brine, as described in this Leaflet, is not necessary when it is to be stored in a cold-storage locker.

### Bulk Storage of Fruits and Vegetables

Some locker plants receive requests for the temporary or seasonal, chill-room storage of bulk fruits and vegetables. The special temperatures recommended for these various products range from 31° to about 50° F. with relative humidities of from 60 to 95 percent depending on the product stored.

Some vegetables and fruits such as Irish seed potatoes, cabbage, onions, apples, citrus fruits, and grapes are adapted to cold storage for a period of one or more months. Other products such as ripe tomatoes, lettuce, peaches, melons, and berries often deteriorate if held in storage for more than a few days.

Pecans and chestnuts should be put in cold storage shortly after harvest but unshelled walnuts and peanuts usually can be held satisfactorily over the winter in common storage.

The storage qualities of fruits and vegetables vary widely with the variety and often with the locality in which they were grown and the methods used in growing and harvesting.

A locker plant that anticipates the bulk storage of any fruit or vegetable should investigate carefully the characteristics and requirements of the particular product they expect to handle. Circular 278, "The Commercial Storage of Fruits, Vegetables, and Florist's Stocks," published by the U. S. Department of Agriculture, will be helpful.

### Fur Storage

A special room for the storage of fur coats, woolens, feathers, and hair, has proved a profitable addition in a few plants. The necessary average temperatures (40° to 45° F.) and humidities (about 50 to 60 percent) are readily available from the existing equipment in a locker plant. Special protection against fire and theft is needed where valuable furs are to be stored.

Moth control, through the use of refrigeration, is described in Farmers' Bulletin 1353 "Clothes Moths and Their Control." Insurance companies can supply approved specifications for fur-storage rooms together with a statement of approximate insurance premiums. Interested locker owners should check these requirements and costs carefully to see if the expected business would warrant the extra expense.



Summary

A freezer locker will be of greatest service to a family when:

1. It is located conveniently to the home.
2. Home-produced foods are stored in it.
3. Foods adapted to freezing are used.
4. Foods are properly handled, promptly chilled, carefully packaged, rapidly frozen, and stored at near zero temperatures for reasonable lengths of time.

A clean, sanitary, well-operated locker plant will be an asset to a family that tries to provide itself with an ample, varied, palatable, and economical diet. The family must remember, however, that the proper temperature is the chief commodity that the locker plant has to sell and the chief thing that the family needs to buy. Dressing the animal, grinding the sausage, and rendering the lard are jobs which many families can do themselves. Buying this type of service is the easiest but not the cheapest way. Economy for the patrons and permanent, satisfied patronage for the management would seem to depend not so much on duplicating services already available but on supplying suitable, controlled temperatures in a new and more usable way.

